FLOCK MANAGEMENT IN INTEGRATED VILLAGE SYSTEMS

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ABSTRACT. Flock management in integrated village systems is influenced by small land holdings, ownership of small numbers of goats, emphasis on crop production and is closely linked with the two main production systems : systems combining arable cropping (roadside, communal and arable grazing systems; tethering and cut-and-carry systems), and systems integrated with tree cropping. The ownership, decision making and daily management is closely identified with women and children and is a feature in the altiplano regions of Latin America, most sub-Saharan countries and many parts of South and South East Asia. With larger flocks, paid shepherds or peasants are employed to manage the flocks. The major problems are related to improved breeding methods, feeding systems and animal health measures. Alleviating the low level of production is directly related to the removal of these management problems and more efficient use of the production resources. The development of these strategies is likely to have a major impact on the contribution of goats and socio-economic aspects of several million small farmers, landless labourers and low income tenants in integrated village systems in the developing countries.

INTRODUCTION

Integrated systems involving goats and crop cultivation, especially at the village level, is considerably different to that of either the extensive or intensive production systems. Whereas extensive and intensive systems are essentially monoculture in approach involving generally large flocks of goats, integrated village systems are characterised by four distinct features.

Firstly, the ownership of goats is generally small and these are traditionally reared mainly in the rural areas. Secondly, the animals are found in complex integrated systems involving crops and animals in which goats are part of the animal genetic resources. Thirdly, the ownership and management of these goats is usually identified with subsistence farmers, landless labourers and low income tenants who are the poorest of the poor. Fourthly, and in a socio-economic context, integrated systems at the village level generally also involve to a considerable extent, the participation of women and children in decision making processes and in the management of animals very much more than in the other two systems.

valuable source of dietary protein, minerals and vitamins; provide variety in the diet and have a significant effect on performance. Their value especially for goats has been emphasised (Devendra, 1983b), and their efficient utilisation represents an important feeding strategy in the developing countries (Devendra, 1986b).

Except in the larger flocks in integrated systems with tree crops, the goats are usually collectively taken out together for grazing. They are not grouped according to sex. Bucks are thus herded with the does and kids and mating is generally uncontrolled. When the flock returns to the homestead and is housed at nights, the bucks are usually penned separately. Together with the supplementary forages and water that are provided at this time, in many parts of South and South East Asia, it is common practice to burn waste litter adjacent to the pens late in the evening. This is believed to have the dual advantage of keeping the mosquitoes away as well as any predators. In damp weather there is also the advantage of the animals being kept warm.

MANAGEMENT PROBLEMS

There are a variety of management problems on small farms. A number of these are major ones and refer especially to breeding methods, feeding systems and animal health measures. With breeding, the ownership of small number of goats precludes the availability of a buck so that mating does at the right time becomes a major problem, especially also if the farmer is busy with crop cultivation. With larger flocks, bucks are usually part of the herd.

Problems of annual feed shortages and consequent low productivitiy are normal in many parts of the developing countries, and the basic issue is how to improve this deficit situation. Where land is limiting, increased fodder production becomes a problem. The basic strategy is to ensure a feed supply that can be sustained on a year round basis, which means complete use of the total feed resource base. This includes use of available grazing (native and cultivated), cultivated forages including legumes, crop residues, agro-industrial by-products and non-conventional feeds. Conservation measures are important especially if there are chronic drought periods, including the use of strategic supplements of energy, protein, minerals and vitamins in feeding systems that are cost effective.

In integrated systems, the wider use of agro-forestry systems with complementary advantages of forage production, supply of fuelwood, improvement of soil fertility and permanent soil cover and economic land use are worthy of consideration. A very good example in this context concerns the use of L. leucocephala.

Poor husbandry practices drastically reduce the response from goats and sheep and therefore their productivity.

Flock management is dictated by small land holdings, emphasis on crop production (annual and perennial) and the availability of labour. The significance of these characteristics and the importance of goats and sheep, is reflected for example in West Javanese farming systems, where it was found that the contribution of small ruminant production to total income was about 10 - 14% for wealthy farmers and 22 - 23% for landless and subsistence farmers (Knipscheer and Soedjana, 1982).

The integrated systems combining crops and animals also have certain features. The crops may be annual and include examples such as cassava, maize, sorghum, rice or wheat. The perennial crops include cashew, cocoa, coconut, oil palm and rubber. Crop cultivation is dominant within the system in which a variety of animals are usually reared. In Asia, more than in any region, small farm systems combining crops and animals are the backbone of agriculture. Table 1 summarises the characteristics of the predominant farm systems with reference to type of production systems, type of ruminants reared, production objectives, average size of flocks and current importance, based on ownership.

Large ruminant such as buffaloes or cattle may be reared, but in view of limited resources, smaller animals are supported more commonly, of which goats are very common. In addition to goats, sheep, pigs, rabbits, chickens, ducks or geese are also reared depending on the extent of the available resources and degree of diversification. The management of goats is thus dictated by a scenario which is varied in terms of the use of production resources, diverse in the farming objectives and operations and with a socio-economic dimension involving very poor subsistence peasants who have been the focus of much interest and attention in recent years. This paper is concerned with these aspects.

SIZE OF HOLDING

An important feature about the village systems is the small size of holding. This size varies between regions and between countries. Table 2 shows that for goats, the highest percentage below 1 ha of land was found in Asia, followed by South America and Africa. A parallel situation existed for sheep. On the other hand, Africa and South America had the highest perentage of holdings without land.

THE VILLAGE PROFILE

The village is the focal point of all forms of activities, mainly agricultural, economic and cultural. It is variable in size with respect to the number of households, ranging from a few hundred such as in parts of South East Asia, to several thousands in a cluster in West Africa. The village economy is based on crop production, primarily to meet the subsistence needs of the peasants but also to provide some cash. The crops grown are varied, but cereals (maize, rice

and wheat), and root crops (cassava, sweet potatoes and yams) are important staple foods in most developing countries. A variety of animals are kept for various purposes inte alia : income, employment, security, power, food, fertiliser, fuel, by-product utilisation, social values and recreation.

The village scenario includes several types of poor people. Small farmers, including landless labourers and low income tenants are peasants who are usually crop-oriented. They are essentially poor people who face geographic isolation. They continuously experience hunger and rural poverty, and probably because of this, have the capacity to adapt and survive hardship. There is resistence to changes because of inability to use new technology. Being illiterate, the majority are not interested in extension materials. They provide the family labour which is dependent on the scale and magnitude of the farm operations including rearing livestock and the contribution from them. They shephered or tether their animals. Children are often used for herding small ruminants. Landless agricultural labourers provide surplus labour which is of added value to the more progressive farms (Devendra, 1983a)

The crops are grown on usually small size holdings (below 1 ha), and this pattern is common throughout Africa, North and Central America and especially Asia. In Asia, both the proportion of size of holding, the agricultural population, human and animal population densities are the highest in the world.

The value of animals, especially small ruminants in village systems involving small farms, is also demonstrated by the prevailing sharing arrangements in their ownership. Attendant advantages of such sharing are the prevention of overstocking in small land areas, the opportunity it offers to landless and tenant farmers to own some livestock, and for some employment to manage the flocks.

The inadequacy and intensity of land use in many parts of Asia is reflected in table 3 which shows the relationship between land and types of livestock holding in Bangladesh. It can be seen that goats were the predominant animals kept and that 44% of the goat population was held in land holdings of 0 - 0.5 ha. The survey results also showed that over the last 5 years, the goat population on these holdings was increasing, followed by cows (Bangladesh Agricultural University, 1986).

In Malaysia, an extensive livestock survey in the Muda rice growing area showed that about 87% of all the rural households were engaged in livestock keeping. Of these, 89.4% of all households owned chickens, 47.1% ducks, 26.7% cattle and buffaloes and 7.7% goats. Table 4 gives details of the types of animals owned and the average numbers kept. It will be seen that emphasis is given to poultry (chickens and ducks) on these rice farms.

FLOCK MANAGEMENT

The management of goats in the integrated village systems are closely associated with the type of production system. These are broadly of two categories :

I. Systems combining arable cropping
   (i) Roadside, communal and arable grazing systems
   (ii) Tethering, and
   (iii) Cut-and-carry feeding

II. Systems integrated with tree cropping

I. Systems combining arable cropping

(i) Roadside, communal and arable grazing systems

Grazing on roadsides and on communal (waste) land may be practised by landless owners and agricultural labourers. It is also undertaken by some when their privately owned lands are under arable crop cultivation. Grazing in fields is restricted to periods immediately after harvest when the feeds available consist of the aftermath of the crop (eg. rice stubble and some regrowth from the stubble), any weeds which grow in the paddies, the grasses that are found on paddy bunds, and browse from shrubs and trees that grow in it. Where multiple cropping is practised, the crop aftermath may be burnt after the harvest and stubble grazing may be severely restricted or non-existent.

The management of the goats is dependent on the size of the flocks. The task is usually entrusted to children when the flock is small (up to about 20 goats), or to hired shepherds when the sizes are larger (above 20 goats). The duration of grazing is partly determined by the availability of labour, size of the flock and also rainfall. With smaller flocks where women and children are involved, the duration of grazing is often done in between schooling hours, with women taking the animals out in the morning and the children attending to them, as well bring back the flock later in the evening.

With larger flocks, the shepherds graze the sheep more permanently for longer hours and after over longer distances of up to 10 km. The average grazing time is about 8 hours per day. A feature about all systems which entail grazing is that the goats are usually taken out when the morning sun is bright and warm, around 10.00 hours to prevent any contact with surface moisture. In the more humid parts of the tropics, this procedure is believed to be related to a reduced incidence of contagious ecthyma.

Some idea of the types of areas grazed by goats and sheep and the degree of preference for some areas, influenced also by the type of crop cultivated is shown in table 5,

based on surveys of small ruminant farmers in Sumatra, Indonesia. Roadside grazing was very common. The grazing distance of 0.1-0.3 km, and grazing time of 2.6-3.7 km/day is relatively small (table 5).

In India, the farmers of Andhra Pradesh pay premiums for penning goats in their fields to increase soil fertility. Flock masters are paid 5 Rs per night for tethering 100 goats in the farmer's fields. During this time, a flock master is given three free meals a day by the farmer who benefits from the return of dung and urine. Following the crop harvests, goats are let loose to utilize the crop residues and fend for themselves. This practice continues till the rains set in, following which the crop farming operations commence once again. This system is evident with short-term crops in the West Indies, sorghum and wheat cultivation in Mexico, and the cultivation of rice throughout countries in South East Asia. Very seldom, however, are the goats fattened or stall-fed with one or more of the crop residues with supplementary feed ingredients in a feeding system. The system of goats grazing cereal stubble land or other crop residues requires minimum labour since the goats are managed by children or unpaid family labour. The grazing of these stubbles is a common feature of management and complements crop-oriented agriculture.

(ii) Tethering

Tethering is adopted when there is a need to prevent animals wandering into areas being cropped and also to ensure that they graze down the available feed in a given area before they are moved. It is also undertaken in situations where very few animals are owned or when labour is limiting. This type of confinement feeding is most popular in South East Asia, parts of Africa, North and Central America especially in situations where multiple cropping is very widespread. Goats may be tethered on waste grazing areas close to the farm or on rice fields after harvest to regulate stubble grazing or close to stacks of rice straw to allow self-feeding.

Tethering is an excellent and cheap method of control using a rope about 3 m long which is pegged. Goats are usually tethered singly, but sometimes several are led by one person, instead of herding them while they graze. A more sophiscated method is the 'running wire', in which the tether is attached by a sliding metal ring to a long wire tightly stretched between two short posts. The wire must be fixed to the top of the posts, to prevent the tether winding round them. If more than one goat is tethered to the same wire they must be prevented from tangling with each other. This is usually done by fixing a length of wood or bamboo, twice the length of the tethers, onto the wire between goats so that their rings cannot pass the blocks. This method is troublesome, and is justified only in special circumstances, such as grazing evenly across a crop or special pasture, and this can equally well be achieved by using separate runnings

wires for each goat. Shade is important and drinking water and shelter from rain must be provided when required. It is essential to change the place of tethering every day, so that fresh herbage and a variety of different feed plants can be obtained by the animal.

In densely populated agricultural areas such as Northern Nigeria, or West Java in Indonesia, or many parts of the Indian sub-continent, the tethering of goats on crop residues during the early part of the dry season could be combined with zero grazing for the rest of the year. Similarly, housing with hand feeding could be varied with grazing at suitable times, eg. during dry spells in and just after the wet season. The great advantage of permitting some grazing is that it gives the goat some opportunity to supplement the diet provided for it under zero grazing, and thus some chance of using its selective feeding habits to overcome any dietary deficiencies.

(iii) Cut-and-carry system

In the cut-and-carry system a large proportion of the feed is usually brought in from outside the farm because of the small size of holdings in relation to the number of animals kept. The system is subject to the vagaries to seasonal abundance and shortage of forage that characterise it. Since the animals are housed most of the time, this results in a growing dependence on high priced concentrate feeds during lean periods.

The system has had limited success because of the value of arable land for food production. This also presents a constraint to forage production for animals. On the other hand, the emphasis on crop production makes available large quantities of crop residues which are valuable feeds to goats.

The cut-and-carry or stall feeding system requires high labour and capital investment. It is a system that favours situations where there is no land or more particularly, the availability of abundant supplies of crop residues and agro-industrial by-products. Probably because of the higher capital investment, it has not been adequately used as a system. In Fiji, it has been reported that goats fed sugarcane tops, stovers, straws, coconut cake, rice bran and molasses reached live weight of 23-25 kg in about 22 weeks with a daily live weight gain of 154 g, compared to 83 g in the extensive system (Hussain et al., 1983). Likewise is India, Sehgal and Punj (1983) have demonstrated the value of feeding 80 g NaOH/kg with wheat straw which gave maximum growth rates in growing kids.

II. Systems integrated with tree cropping

In this system, the available land area under tree crop such as coconuts, oil palm, rubber is very much larger than in systems combined with arable cropping. In view of this,

the management of goats is more extensive and requires supervision by paid shepherds or owners of flocks. The animals utilise the available grasses, weeds and waste herbage under the crop and are grazed rotationally in various parts of the estates. Shepherding the animals is important to ensure that the goats do not damage the crop. Goats for example, are not welcome in rubber plantations because of damage to the bark. Young trees are likely to be more suceptable to browse damage, as may be the new dwarf coconut hybrids and young oil palm plants.

There are also possible effects of primary crop management on the goats. One concerns the possible residual effect of herbicides. The other possible effect is the ingestion of latex with consquent metabolic disorders. With oil palm, there could be intoxication problems from the ingestion of fruitlets in oil palm fruit bunches.

An important issue concerned with integrated tree cropping systems is the requirement for fencing. Fencing is important not only for controlling grazing but also from predation by dogs. On these large estates, fencing and shepherding of animals will be influenced by labour availability and the requirements for the movement of machinery.

FEEDING MANAGEMENT

The feeding management consists mainly of grazing, feeding of any cut fodder and the occasional use of crop residues and agro-industrial by-products produced in the farm. Very seldom are purchased concentrates fed. These are in any case not really necessary for meat production, which is the main production objective throughout the tropics. Kitchen wastes and remnants, including salt and water are however, extensively fed to goats in the village system. Probably because of this and especially with systems involved with arable cropping the goats tend to congregate near the homesteads in the villages.

Table 6 provides some idea of the type of village feeding systems. While all goats are grazed for part of the day, a high proportion of the farmers also fed tree leaves. These tree leaves are usually cut and brought back with the flock at the end of the day and represents a standard feeding practice by all small farmers. Alternatively, many farmers in Africa and Asia lop the trees with long sticks at the end of which is a sickle. The goats forage on the fallen leaves and continue to graze.

A variety of tree leaves are used, but the more common ones are banyan (Ficus bengalensis), cassava (Manihot esculenta Crantz), jackfruit (Artocarpus heterophyllus), gliricida (Gliricidia maculata), leucaena (Leucaena leucocephala), pigeon pea (Cajanus cajan) and sesbania (Sesbania grandiflora). These proteinaceous forages supply a

Conversely. the effects of improved feeding and management on performance are spectacular and is seen in the results reported in goats in Malaysia (Devendra, 1979) and goats in India (Sachdeva et al., 1979; Parthasarathy, Singh and Rawat, 1983). In Fiji, improved husbandry, feeding, disease control and breeding has been shown to increase the annual rate of reproduction from 120 to 180% and well fed does to produce their first kid in 12-13 months age (Hussain et al., 1983). This is therefore an area that merits very much more attention than in the past in all types of integrated systems involving crops and animals.

Problems of animal health are acute and represent a very serious source of economic loss in many developing countries. These relate especially to parasitism and transmissable diseases such as coccidiosis and caseous lymphadenitis and pleuropneumonia. With grazing animals, endoparasites are especially common and also ectoparasites. With the former, regular cost-effective drenching is necessary.

Goats appear to be more susceptible to gastrointestinal parasitism than sheep. In Bangladesh, for example, 82.2% of 214 kids born died within six months of age, of which respiratory disorders, gastrointestinal parasitism and contagious ecthyma were the main causes. In adults, 47.8% mortality was recorded for gastrointestinal parasitism and respiratory disorders (Abdur Rahman, Ahmad and Mia, 1976). Likewise in Sri Lanka, kid mortality from 2340 pregnancies was reported to be 28% (Ranatunga, 1971).

THE ROLE OF WOMEN AND CHILDREN

The role of women and children in the management of goats in integrated village systems represents one of the unique features of the systems. This is often an under-estimated issue, but their contribution to goat rearing, and the benefits of this to the stability of small farm systems and the household is very much more than is realised.

The management of goats and sheep, especially small flocks in village systems is more the purvue of women than that of men. This is the case in the altiplano regions of Latin America, most sub-Saharan countries, the Indian sub-continent and South East Asia. In South and South East Asia, women take care of goats and or sheep and often own them. In Upper Volta, Mossi, Fulani and Rimalbe women own goats and consider them an investment; Mossi women in particular view them as an insurance against famine (Safilios -Rothschild, 1983). In Mali, a survey of five villages among the Marka, Peulh Rimaibe and Cuerga ethnic groups showed that goats and sheep were mostly owned by women either through inheritance from their mothers, through purchase with income from selling agricultural produce. Ownership represents prestige and security to the women in case of divorce or seasonal immigration of the husband and allows them to meet

family and social obligations such as in the purchase of clothes, care of sick children and ceremonial costs (Safilios-Rothschild, 1983). Although women often own the goats, husbands participate in the decision to sell, and among the poor farmers of the Peruvian altiplano, only men can sell the animals (Deere and Leon de Leal, 1982).

Tables 7 and 8 based on survey results in West Java, Indonesia, present some interesting results. They indicate that participation by family members was quite significant. Although there were locational differences, women and children had an important influence on the management of goats (table 7). Table 8 based on a survey of 24 households, showed that the participation of wives in herding, collecting forages, the frequency of feeding, and supplying water and in health control of the animals was also significant.

The results in table 8 further showed that the women's share of involvement in rearing small ruminants increased with increasing number of animals reared. Additionally, literate women were more involved in the physical activities of management (herding, grass cutting, feeding, watering and health control) than in decision making (planning and marketing) probably because of their perception for the animal's needs. Illiterate women by comparison, involved their husbands in all activities (Wahyuni, Suradisastra and Juarni, 1983). In a later study, Wahyuni, Gaylord and Knipscheer (1985) reported that the extent of decision making either by men or women varied accordingly to their individual perceptions, however, this did not detract from the fact that women may be equally as important as their husbands in the decision making process concerning the rearing of small ruminants in mixed farm systems in Java, Indonesia.

CONCLUSIONS

The management of goats in integratged village systems centres usually on the ownership by small farmers, landless labourers and low income tenants of small numbers of animals. The small numbers are dictated by small land holdings mostly below 1 ha, emphasis on crop production (annual and perennial) and the availability of labour. Flock management is closely related to the type of production system : systems combining arable cropping and systems integrated with tree cropping. In both systems, the role of women and children in decision making and especially in herding and management of the animals is significant. The benefits of this ownership include increased cash income, food, security and stability of small farm systems. The major problems of management relate to inadequate feed resources and animal health problems. Low productivity per animal is common and alleviating this situation is directly related to the removal of management problems and more efficient use of the production resources. Development strategies thus need to address these major issues, the improvement of which will have a major impact on increased productivity as well as the socio-economic well being of several million poor people in the developing countries.

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TABLE 1

TYPES AND CHARACTERISTICS OF FARM SYSTEMS INVOLVING SMALL RUMINANTS IN ASIA

(Devendra, 1986a)

Type of farm system	Cropping pattern	Type of ruminants+	Small Ruminant Production objective	Average size of goat and sheep flocks	Current Importance++
Crops	Rice	B,C	Goat meat/mutton	1 - 5	Low
Crops	Mixed Rice-maize*	C,B,G,S	Goat meat/mutton	1 - 5	Low
Crops	Mixed Rice-wheat	C,B,G,S	Goat meat/mutton/milk	10 - 30	Medium/low
Crops	Mixed Rice	B,C,G,S	Goat meat/mutton	1 - 5	Low
Crops	Wheat	C,B	Goat meat/mutton/milk	10 - 30	Medium/low
Crops	Wheat-rice	C,B	Goat meat/mutton	10 - 30	Medium/low
Crops	Coconuts	G,S	Goat meat/mutton	10 - 40	Medium/low
Crops	Oil Palm	B,G,S	Goat meat/mutton	8 - 30	Medium/low
Crops	Rubber	C,G,S	Goat meat/mutton	8 - 30	Medium/low

+ B = Buffaloes, C = Cattle, G = Goats, S = Sheep

++ Based on average ownership by small farmers, landless labourers and peasants.

* Mixed crops refer to root crops, oil seeds, cash crops, vegetables and also fodders

TABLE 2

DISTRIBUTION OF ANIMALS BY SIZE OF HOLDING IN THE DEVELOPING COUNTRIES BY REGION (FAO, 1981)

Region (No. of reporting countries is given animals in parenthesis)	Total No. of animals (10^6)	Holdings without land*(10^6)	% distribution					
			Under 1 ha	1-5 ha	5-20 ha	20-100 ha	100-500 ha	500 ha
I. Goats								
Africa (4)	1.8	309.7	9.9	38.5	38.6	11.9	0.8	0.3
N & C America (2)	2.3	0.3	0.0	0.3	1.3	15.3	32.4	50.7
South America (4)	8.9	309.3	10.4	28.3	21.1	21.6	12.6	6.0
Asia (5)	12.6	140.5	33.6	30.7	27.8	7.5	0.3	0.1
II. Sheep								
Africa (4)	4.7	1,194.9	4.4	20.9	43.5	26.7	4.1	0.4
N & C America (3)	20.6	0.1	0.0	0.1	1.2	16.0	32.9	49.7
South America (5)	50.5	4.5	5.6	9.5	7.0	9.9	17.9	50.1
Asia (5)	13.9	662.8	19.9	26.4	37.2	13.8	2.0	0.7

*Establishments with no agricultural land which raise livestock and livestock products

TABLE 3

RELATIONSHIP BETWEEN LAND AND LIVESTOCK HOLDING IN A VILLAGE OF MYMENSINGH DISTRICT, BANGLADESH

(Bangladesh Agric. Univ., 1986)

Land holding (Ha)	% of total households (200)+	Types of Livestock (%)			
		Goat	Cow	Bullock	Young Stock
0 - 0.5	39	44	33	6	39
0.5 - 1.0	16	15	19	23	12
1.0 - 1.5	15	10	15	23	19
1.5 - 2.0	5	11	9	15	7
Over 2	12	20	24	33	23
---	13	--	--	--	--

+ 13% of the households had no animals

TABLE 4

PERCENTAGE OF RURAL HOUSEHOLDS ENGAGED IN LIVESTOCK ACTIVITIES AND THEIR OWNERSHIP IN THE MUDA RICE GROWING AREA, MALAYSIA

(Adapted from Lai et al., 1973)

Category	% of households	Average number kept
Rural households engaged in livestock activities	87†	-
Chicken	89.4††	13.0
Ducks	47.1	15.0
Cattle and buffaloes	26.7	1
Goats	7.7	4
Pigeons	0.5	15
Geese	0.4	6

†Total rural households were 5,274

††Refers to percentage of households rearing each of these species

TABLE 5

TYPES OF GRAZING AREAS USED BY FARMERS IN GALANG AND SITIUNG AREAS IN SUMATRA, INDONESIA (Pulungan et al., 1985)

Grazing area	Galang[+] (%)	Sitiung[++] (%)
Roadside/field	33	46
Near the house	0	50
Rubber estate	30	0
Rice field	26	0
Crop field	11	0
Woods	0	4
Grazing distance (km/day)	0.3 ± 0.30	0.1 ± 0.16
Grazing time (hr/day)	3.7 ± 1.13	2.6 ± 0.74

[+]Mainly tree crops area

[++]Mainly primary and secondary forest area

TABLE 6

TYPES OF FEEDING MANAGEMENT OF GOATS AND SHEEP FARMERS IN GALANG AND SITIUNG AREAS IN SUMATRA, INDONESIA (Pulungan et al., 1985)

Feeding systems	Galang[+] (%)	Sitiung[++] (%)
Grazing	74	0
Grazing & Cut-and-carry	26	68
Cut-and-carry	0	32
Leaf supplement		
Jack fruit	17	49
Cassava leaf	0	41
Crop by-products		
Rice bran	0	41
Kitchen waste	9	0
Salt	55	95
Water	45	100

[+] Mainly tree crops area

[++] Mainly primary and secondary forest area

TABLE 7

THE PARTICIPATION OF FAMILY MEMBERS IN HERDING ANIMALS, THE LENGTH AND THE DISTANCE OF HERDING IN JAVA, INDONESIA

(Muljadi, Knipscheer and Mathius, 1984)

Characteristic	District					
	Garut		Cirebon		Bogor	
1. Sheep farmers	30		16		22	
Goat farmers	0		12		6	
2. Farmers herding	10		15		6	
3. Family members						
Husband	6		5		3	
Wife	0		2		2	
Son	5		10		4	
Daughter	0		1		0	
Other(s)	0		3		0	
4. Length grazing (min/day)	166	(45)+	292	(14)	147	(28)
5. Distance herding (km/day)	1.63	(0.59)	3.27	(0.40)	2.1	(0.74)

+ Standard deviation

TABLE 8

WOMEN'S INVOLVEMENT IN SMALL-RUMINANT PRODUCTION PROCESS (%)

(Wahyuni, Suradisastra and Juarni, 1983)

Activities / Criteria	Planning	Organizing	Controlling	Marketing	Herding	Grass cutting	Feeding	Watering	Health control
Wife	30	25	41	25	63	34	54	67	75
Wife & husband	38	43	29	54	16	21	21	21	8
Wife & children	16	16	17	13	21	41	21	12	13
Husbandry	16	16	13	8	-	4	4	-	4
Total (%)	100	100	100	100	100	100	100	100	100